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A new species of the genus *Stumpffia* (Amphibia: Anura: Microhylidae) from a small forest remnant of the central high plateau of Madagascar

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A new species of the genus *Stumpffia* (Amphibia: Anura: Microhylidae) from a small forest remnant of the central high plateau of Madagascar. - A new frog species of the terrestrial and leaf litter dwelling genus *Stumpffia* is described. *Stumpffia helenae* sp. n. has enlarged finger tips and partially reduced fingers and toes. It is the first record of the genus from the central high plateau of Madagascar. Since this frog was discovered in small forest fragments, this record shows how important small forest remnants could be for nature conservation.

Key-words: Amphibia - Anura - Microhylidae - *Stumpffia* - new species - Madagascar - high plateau - forest fragment - nature conservation.

INTRODUCTION

In Madagascar the family of Microhylidae is represented by ten endemic genera distributed in three subfamilies: Scaphiophryninae, Dyscophinae and Cophylinae (Glaw & Vences, 1994). *Stumpffia*, a genus containing small to very small species that often have reduced fingers and toes, belongs to the latter subfamily. At present, the genus *Stumpffia* contains seven species: *Stumpffia psologlossa* Boettger, 1881, *S. tridactyla* Guibé, 1975, *S. pygmaea* Vences & Glaw, 1991, *S. tetradactyla* Vences & Glaw, 1991, *S. grandis* Guibé, 1974, *S. roseifemoralis* Guibé, 1974, and *S. gimmeli* Glaw & Vences, 1992. In this paper a new species of *Stumpffia* is described. It was found in a forest remnant of the nature reserve of Ambohitantely and is the first record of this genus in the central high plateau of Madagascar.

MATERIALS AND METHODS

Animals were collected during a survey for ecological research. After anaesthesia with ether specimens were fixed in 90% ethanol and stored in 70% ethanol. All measurements were taken with dial callipers to a precision of 0.1 mm. Unless otherwise stated the following parameters were measured according to Duellman (1970): snout-vent length; head width; forearm length; hand length (from the tubercle

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at the base of finger I to the tip of the longest digit); tibia length; foot length including tarsus (from the joint between the tibiofibula and ankle to the tip of toe IV); foot length (from the base of the metatarsal tubercle to the tip of toe IV); horizontal tympanum diameter; horizontal eye diameter; distance from eye to nostril; distance from nostril to snout tip. All measurements are in millimetres. Photos were taken to document the colour of the living animals.

The following abbreviations are used: NMBE = Naturhistorisches Museum Bern; SMF = Senckenberg Museum Frankfurt; ZFMK = Zoologisches Forschungsinstitut und Museum Alexander Koenig.

The following specimens were used for comparison: *Stumpffia psologlossa* (SMF 7337; holotype), *S. grandis* (NMBE 1034195), *S. gimmeli* (ZFMK 52536; paratype). For the other species data were taken from literature (Vences & Glaw, 1991; Glaw & Vences, 1994).

RESULTS

Stumpffia helenae sp. n.

Holotype: NMBE 1044802 (Figs 1a, 1c, 2a and 2c) Adult ♂ from the "Reserve Spéciale" (RS) d'Ambohitantely, central high plateau of Madagascar, Ankazobe Fivondronana, Antananarivo Province, 18° 09' S, 47° 15' E, 1500 m a. s. l., 25 March 1997, D. Vallan leg.

Paratype: NMBE 1044801 (Figs 1b, 1d, 2b and 2d) Adult ♀, same locality and collector as the holotype, 23 March 1997.

Diagnosis: Due to its general features (small size, partially reduced fingers, connected lateral metatarsals, inner metatarsal tubercle present, outer metatarsal tubercle absent, webbing between fingers and toes absent, no signs of external vocal sac are visible, terrestrial habits and slow motion moving) I include this species to the genus *Stumpffia*. Differentiation from other *Stumpffia* species: The most similar species are *S. gimmeli* and *S. psologlossa*. Both species have a similar size and can be similarly coloured. In all three species (*S. gimmeli*, *S. psologlossa* and *S. helenae* sp. n.) fingers and toes are clearly recognisable but *S. gimmeli*, *S. psologlossa* differ in having less reduced fingers and toes. They also lack the enlarged fingertip. As shown in Tab. 1 *S. helenae* sp. n. differs from all other *Stumpffia* species by the combination of size, digital reduction and the enlarged fingertips. Enlarged fingertips are usual in species of several genera (*Anodonthyla*, *Plethodontohyla*, *Cophyla* and *Platypelis*) of the microhylid family but not known from species of the genus *Stumpffia*. I presume that *Stumpffia helenae* sp. n. belongs to the genus *Stumpffia* due its enlarged finger tips mainly because of its reduced finger and toes and the slow motion moving. In Malagasy anurans these two characteristics are only known in species of the genus *Stumpffia*.

Description of the holotype: A ♂ of 13.8 mm length. Also if the animal was not found calling, the presence of nuptial pads indicate that the holotype is an adult ♂. Four fingers and five toes present. Finger II is slightly and finger I is more reduced. Toe I is also reduced (Figs 2a and 2c). Tip of finger III is slightly enlarged and triangular (due to the small size of the only known holotype and paratype, further

TAB. 1. Comparison of the characteristics between *Stumpffia helenae* n. sp. and other species of the genus. In the column "number of fingers" and "number of toes" the first number refers to the number of not reduced fingers and toes, the second to the number of reduced but present fingers and toes and the third number refers to the number of completely reduced fingers and toes.

Species	Sex	length (mm)	Tibiotarsal articulation reaches the ...	Tympanum/ eye ratio	number of fingers	number of toes	enlarged 3. finger tip
Stumpffia helenae sp. n. [1]	♂	13.8	... eye	1/2	2/2/0	4/1/0	yes
S. psologlossa [2]	?	14.5	... eye	1/4	4/0/0	5/0/0	no
S. tridactyla [5]	♂	10 - 11	... tympanum	2/5 - 3/4	0/3/1	2/2/1	no
S. pygmaea [5]	♂	10 - 12	... tympanum	1/2 - 2/5	3/1/0	4/1/0	no
S. tetradactyla [5]	♂	13 - 15	... eye	1/3 - 1/2	3/1/0	4/0/1	no
S. grandis [3]	♂	18.0	... eye	3/4	3/1/0	4/1/0	no
S. roseifemoralis [5]	♂	22	... eye	3/5	3/1/0	4/1/0	no
S. gimmeli [4]	?	12.9	... eye	1/3	4/0/0	5/0/0	no

[1] NMBE 1044801, [2] SMF 7337, [3] NMBE 1034195, [4] ZFMK 52536, [5] Data from Vences & Glaw, 1991 and Glaw & Vences, 1994

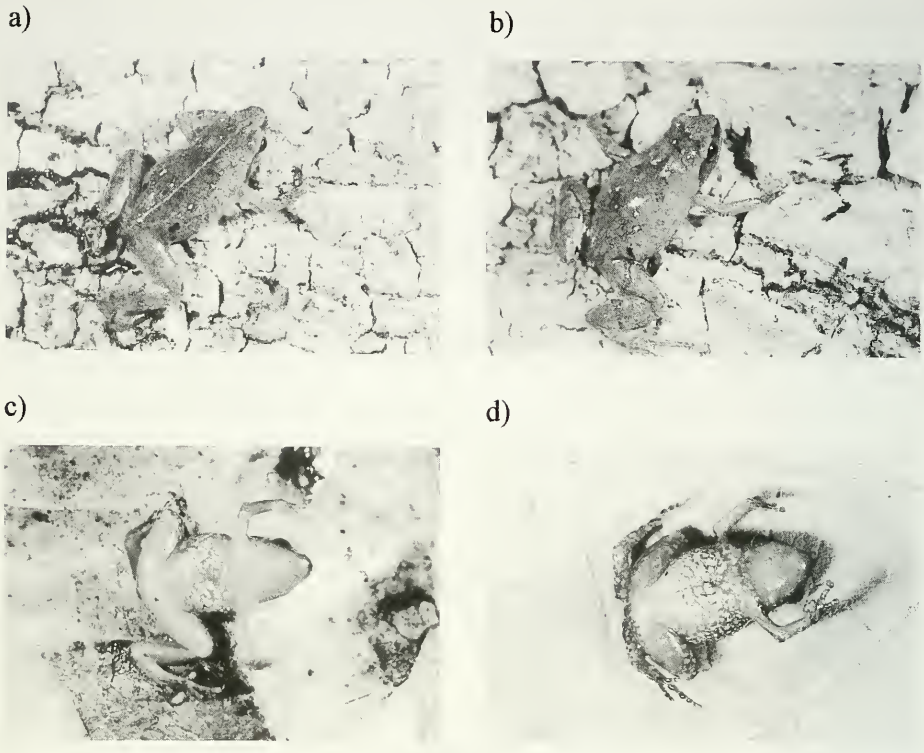

FIG. 1

Dorsal (a) and ventral (c) view of ♂ *Stumpffia helenae* sp. n. (holotype: NMBE 1044802). Dorsal (b) and ventral (d) view of ♀ *Stumpffia helenae* sp. n. (paratype: NMBE 1044801).

osteological analyses - e.g. enlarged end of the phalanx - were impossible without damage them). Dorsal skin slightly granular. Tibiotarsal articulation reaches the posterior edge of the eye. Measurements of the holotype: head width: 4.5; forearm length: 3.0; hand length: 2.1; tibia length: 6.6; foot length including tarsus: 9.3; foot length: 5.4; tympanum diameter: 0.7; eye diameter: 1.3; distance from eye to nostril: 0.9; distance from nostril to snout tip: 0.6. The left forearm is broken.

Description of the paratype: A ♀ of 15.0 mm length (since the size of the paratype is similar to that of the holotype (adult ♂) and nuptial pads are absent, it can be assumed that the paratype is an adult ♀). Similar to the holotype except fingertip less enlarged (Figs 2a and 2b), and the skin on the back smoother than in the holotype. Measurements of the paratype: head width: 5.1; forearm length: 3.5; hand length: 3.1; tibia length: 7.2; foot length including tarsus: 10.7; foot length: 6.2; tympanum diameter: 1.0; eye diameter: 1.6; distance from eye to nostril: 0.9; distance from nostril to snout tip: 0.7.

Colour in life: The ♂ had a dark grey, marbled colour on the back (Fig. 1a). In the inguinal region two black spots were present (probably an imitation of eyes). An

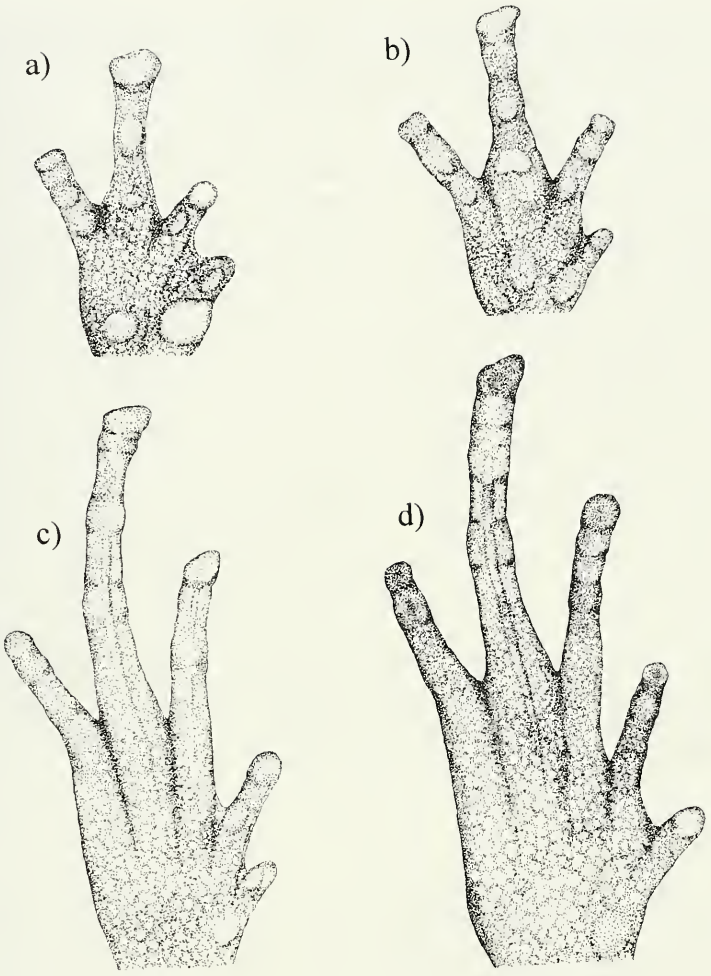

FIG. 2

Hand (a) and foot (c) of ♂ *Stumpffia helenae* sp. n. (holotype: NMBE 1044802). Hand (b) and foot (d) of ♀ *Stumpffia helenae* sp. n. (paratype: NMBE 1044801).

orange line was present on the middle of the back, extending from the middle of the head to the posterior end of the body. On both sides of the dorsal line two lines of small weakly elevated light spots were visible. A thin creamy and golden line extended from the humeral joint of the arm passing above the eye to its posterior edge. The sides of the head were dark grey but not marbled. The dark grey colour of the flanks (same colour as the sides of the head) was covered by lighter spots. The colour of the dorsal side of arms and legs was similar to the colour of the back but a

bit lighter. The throat, the belly and the ventral sides of the extremities were light grey with a few indistinct lighter spots (Fig. 1c). The chest was also light grey but covered by irregular white patches, giving to the chest a netlike impression. No distinct border present between the coloration of the dorsal and ventral side. The oval (horizontally flattened) pupil is surrounded by a golden iris. Compared to the coloration of the ♂, the coloration of the ♀ shows the following differences (Fig. 1b and 1d): the colour of the back was rather brown than grey, the orange line present in the ♂ was nearly not visible in the ♀ and the primary colour of the chest was not light grey but pink.

Colour in preservative: After 22 month in preservative the colour has changed little. The brown colour of the back of the ♀ and the orange line on the back of the ♂ changed into grey and light grey respectively. The pink colour of the ♀ chest faded out. On the ventral side of the legs the indistinct white spots became visible.

Etymology: I wish to dedicate this new species to my wife and friend Helena Bigler for her support of my research and her enthusiasm for Madagascar.

Distribution: *Stumpffia helenae* sp. n. is just known from the type locality.

Habitat and habits: Both known animals were found in the high plateau rain forest of the RS d'Ambohitantely, which was described by Koechlin (1972) as "high-altitude lichen forest". This forest contains wetter (riparian) and dryer (on slopes, plateau and ridges) forest types as described by Razakanirina (1993). The ♀ was active during the day in the leaf litter of the riparian forest 1 m from a brook. The ♂ also was active during the day in the leaf litter but far from brooks in the dryer slope forest. The riparian forest is characterised by trees to a canopy height of 20 m and a relatively sparse undergrowth vegetation, whereas the slope forest is characterised by a lower canopy and a denser undergrowth vegetation.

DISCUSSION

It was surprising to find a *Stumpffia* in Ambohitantely since this genus was mainly known from middle or lower altitudes. *S. gimmeli* is known from the Montagne d'Ambre, *S. roseifemoralis* from the Marojezy massive and *S. grandis* from both mountains, but they do not reach altitudes much higher than 1000 m a.s.l.. Raxworthy & Nussbaum (1996) mentioned a not specified *Stumpffia* species from the Tsaratanana mountains in 2050 m a.s.l.. *Stumpffia helenae* sp. n. is one of the few records of this genus from higher altitudes (1500 m a. s. l.) and the first record in the central high plateau of Madagascar.

The forests of the high plateau of Madagascar are among the most threatened forests of Madagascar. The "Réserve Spécial" of Ambohitantely is a nature reserve containing one of the last forests. It consists of hundreds of islands of forest, their sizes ranging from 0.16 to 1250 ha making up a total of 2737 ha about half the total reserve area (Langrand and Wilmé, 1997). The paratype was found in the 1250 ha fragment, whereas the holotype lived in a 30 ha fragment. The fragmentation of the forest started centuries ago. Small forest fragments may maintain stable amphibian populations since outside the forest, in the almost completely cleared landscape, the

conditions for the survival of this species are not favourable (high temperature and low air and soil humidity). The discovery of this new species shows the importance of even small forest remnants for conservation.

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